Geophysical Research Abstracts
Vol. 14, EGU2012-7043, 2012
EGU General Assembly 2012

California's Effort to Improve Almond Orchard Crop Coefficients

B.L. Sanden, A.E. Fulton, D.S. Munk, S. Ewert, C. Little, F. Anderson, J.H. Connell, M. Rivera, M.N. Orang, and R.L. Snyder
(blsanden@ucdavis.edu)

California's Effort to Improve Almond Orchard Crop Coefficients

Blake L. Sanden, Allan E. Fulton, Daniel S. Munk, Steve Ewert, Cayle Little, Frank Anderson, Joseph H. Connell, Mark D. Rivera, Morteza Orang and Richard L. Snyder

Almonds are a major agricultural commodity in California and optimal irrigation management is important for production, protecting the environment, and long term water resources planning. While evapotranspiration (ET) estimates are widely used for water resource planning, it is used less for "realtime" irrigation management for several reasons. One problem is the lack of confidence in the crop coefficient (Kc) values that are used with reference ET (ETo) to estimate well-watered crop ET (ETc). This is especially true for orchard crops. Until recently, the Kc values used to estimate the ETc of most orchard crops in California were derived using measurements of applied water, runoff, and soil water content depletion with the assumption that the trees were transpiring at a rate that was not restricted by water availability. For decades, a typical midseason Kc value used for clean-cultivated almond orchards was 0.90. Recently, a study was conducted by the University of California and the California Department of Water Resources to improve the Kc estimates for almond orchards; helping growers improve their on-farm water management for better production and less adverse impacts on the environment. Field experiments were conducted in four locations (Butte, Fresno, Kern, and Tehama Counties) spanning 1000 km north to south within the Central Valley of California over somewhat different climates. California Irrigation Management Information System (CIMIS) weather stations were used with the ASCE-EWRI standardized reference evapotranspiration equation for short canopies to determine ETo. Latent heat flux (LE), in all four orchards, was estimated using the residual of the energy balance equation: LE=Rn-G-H from measured net radiation (Rn), ground heat flux (G), and sensible heat flux (H) using surface renewal and eddy covariance measurements. The LE was divided by the latent heat of vaporization (L) to determine ETc. In three years of measurements in Kern County, the data showed an increase in Kc values from about 0.90 in early April to about 1.15 at the end of August. In Butte County during 2009, the Kc values increased rapidly from about 0.90 to 1.20 from early April to early June and stayed near 1.20 until mid-September. In Tehama County, the Kc values started near 1.00 in April and then dropped to about 0.90 during early May. The Kc values then increased to just below 1.20 at the beginning of July and stay just under 1.20 until late August when they started to decline. In Fresno County, the Kc values fluctuated between about 1.00 and 1.20 during most of mid-season. In general, these midseason Kc values were more than 25% higher than the 0.90 value that was used for decades; confirming that more realistic Kc values were needed. In this paper, we will present the results of these studies and we will discuss the factors that explain the observed differences.

Blake L Sanden, Farm Advisor
UCCE Kern County
1031 South Mount Vernon Avenue
Bakersfield, CA 93307, USA
(661) 868-6218
blsanden@ucdavis.edu

Allan Fulton, Farm Advisor
UCCE Tehama County

1754 Walnut Street
Red Bluff, CA 96080, USA
(530) 527-3101
aefulton@ucdavis.edu

Daniel S. Munk, Farm Advisor
UCCE Fresno County
1720 South Maple Avenue
Fresno, CA 93702, USA
(559) 600-7204
dsmunk@ucdavis.edu

Steve Ewert, Land and Water Use Scientist
San Joaquin District
3374 E. Shields Ave.
Fresno, CA 93726.
(559) 230-3334
sewert@water.ca.gov

Cayle Little, Land and Water Use Scientist
California Department of Water Resources,
Division of Statewide Integrated Water Management, Water Use and Efficiency,
Sacramento, CA 94236, USA
(916) 653-7707
clittle@water.ca.gov

Frank Anderson
U.S. Geological Survey
6000 J St., Placer Hall
Sacramento, CA 95819-6129
(916) 278-3258
fanders@usgs.gov

Joseph H. Connell, Farm Advisor
UCCE Butte County
2279-B Del Oro Avenue
Oroville, CA 95965, USA
(530) 538-7201
jhconnell@ucdavis.edu

Mark Rivera
Department of Water Resources
Northern Region
2440 Main Street
Red Bluff, CA 96080
(530) 529-7300
mrivera@water.ca.gov

Morteza N. Orang, Senior Scientist
California Department of Water Resources,
Division of Statewide Integrated Water Management, Water Use and Efficiency,
Sacramento, CA 94236, USA
(916) 653-7707
morang@water.ca.gov

Richard L Snyder, Biometeorology Specialist
University of California
One Shields Avenue, LAWR

Davis, CA 95616, USA
(530) 752-4628
rlsnyder@ucdavis.edu